SECTION C DESCRIPTIONS AND SPECIFICATIONS

1.0 AUXILIARY POWER SYSTEM (CLINs 0001 and 0003)

1.1 The power system shall replace the two existing 750 KW Emergency Diesel Generators (EDG) and their associated control switchgear with two Ship Service/Emergency Diesel Generators (SS/EDG) and associated control and distribution switchgear. The existing distribution Switchgear shall remain and be used as Load Centers of the new distribution system. The power system shall be rated at 450 volts ac, 3 Phase, 60 Hertz and shall provide electric power meeting the following criteria:

1.1.1	Steady State Voltage:	427 - 477 Volts RMS, 3 percent line imbalance
1.1.2	Steady State Frequency	58.2 - 61.8 Hz
1.1.3	Total Harmonic Distortion	5 percent maximum
1.1.4	Maximum Single Harmonic	3 percent
1.1.5	Maximum Deviation Factor	5 percent
1.1.6	Maximum voltage under failure conditions	600 Volts RMS
1.1.7	Minimum Sustained Short Circuit fault current	8800 Amps RMS
1.1.8	Minimum duration of Short Circuit Current	20 seconds
1.1.9	Power Factor	0.8 lagging to unity

1.2 The system shall meet all operational requirements when operating in the following environmental conditions:

1.2.1 Ambient air temperature surrounding the equipment throughout the range of 35 to 122 degrees Fahrenheit.
1.2.2 Barometric pressure throughout the range of 28 to 31 inches of Mercury.
1.2.3 Relative humidity throughout the range of 10 to 100 percent.
1.2.4 Sea water (cooling) inlet temperature throughout the range of 28 - 130 degrees Fahrenheit.
1.2.5 Exhaust backpressure of up to 13.6 inches of water.
1.2.6 Fuel temperature to the engine of 40 to 115 degrees Fahrenheit.
1.2.7 Inclined at any angle from 0 to 5 degrees from horizontal along the axis of the shaft of the diesel generator set and rolled up to 35 degrees to either side of vertical.

1.3 The system shall recover to within one percent of its steady state operating parameters following a step load transient of 750KW at 0.8 power factor within 1.5 seconds. The voltage during the transient shall not fall below 387 Volts nor rise above 513 Volts. The frequency during the transient shall not fall below 55.8 Hz nor rise above 64.2 Hz.

1.4 The Ship Service/Emergency Diesel Generator sets shall be capable of continuous parallel operation with each other, and with the existing Ship Service Turbo-Generators throughout the permissible load ranges of the diesel engines. The generator set will provide for the automatic division of real and reactive power during parallel operations. The KVAR load of any generator (expressed as a percentage of its KVAR rating) shall not differ from the total KVAR load of all paralleled generators (expressed as a percentage of the total KVAR rating of all parallel generators) by more than 5 percent as load is varied from 0 to 100 percent of the total KVAR rating of the generators at any power factor from 0.5 lagging to 0.8 leading. An adjustable reactive load voltage droop compensation circuit shall be provided. The range of adjustment shall be from zero to at least 10 percent of rated voltage in steps not to exceed 0.2 percent of rated voltage at any load division. The actual KW load of any generator, expressed as a percentage of its continuous KW rating, shall not differ from the total system KW load, expressed as a percentage of the total continuous KW rating of all connected generators, by more than 5.0 percent.

1.5 The governor control system of the SS/EDG shall provide automatic and manual synchronization of each SS/EDG to the ship service bus across the generator breaker and all other bus ties. Additionally the systems shall provide manual synchronization capabilities with shore power, in order to transfer ship's load from shore to ship's power and from ship's to shore power (see Fig. 1, simplified 1-line). The governor shall be provided with both droop and differential real current compensation to provide for kilowatt load sharing. All governor systems will be equipped with a kW load balance

controller. The kW load balance controller will sense real (kW) generator load and provide for automatic load sharing in isochronous mode. The load balance controller will provide a speed droop signal proportional to real (kW) load during droop mode operation. The load balance controller shall be provided with means for adjusting in both isochronous and droop mode. Means for selecting either mode of operation shall be provided. The governor shall have provisions necessary for transferring power from or to other ship's generator sets or shore power connections. The governor system shall have the following operating modes:

(a) Isochronous. Steady state speed regulation with the real differential compensation inoperative shall be between 0 and positive 1.0 percent. Where parallel operation is required real load (kilowatts (kw)) differential compensation shall be performed in order to maintain isochronous speed regulation and real load (kw) balance. The kW load of any generator (expressed as a percentage of its kW rating) shall not differ from the total kW load of all parallel generators (expressed as a percentage of the total kW rating of all paralleled generators) by more than 5.0 percent as load is varied over the range of 0 to 100 percent of the total rated load, at any power factor from 0.5 lagging to 0.8 leading.

(b) Droop (speed-load characteristic). Steady state speed shall be adjusted in the negative direction with increasing kW load by the droop control circuit. Droop mode shall provide stable operation with another generator set with either similar or dissimilar governors, or with an infinite bus (shore power).

1.6 Inspect all existing Ship Service Turbo-Generator interface equipment for operational compatibility with the new Diesel generator system. Provide design and equipment modifications to the speed governor, voltage regulator, circuit breaker and control wiring system to insure intersystem compatibility.

2.0 1825KW SHIP SERVICE/EMERGENCY DIESEL GENERATOR SET (CLIN 0001AA and 0003AA)

2.0.1 The SS/EDG shall be capable of operating as an Emergency Diesel Generator or as a Ship Service Diesel Generator or be locked out for Maintenance.

2.0.1.1 When operating in the Emergency or Stand-by Mode, The SS/EDG mode selector switches will be set in the Stand-by mode. The SS/EDG's will then be ready to automatically supply power to their associated emergency switchboard on a loss of SSTG power. When operating in this mode the bus-ties circuit breakers between 1A SS/E & 1S SWBD's and between 2A SS/E & 2S SWBD's will be closed. The bus-ties between 1A SS/E and 2A SS/E SWBD's will be open. The feeder between 1A SS/E and 1E Switchboard along with the feeder between 2A SS/E and 2E Switchboard will be closed. Upon the loss of SSTG power the bus-tie breakers between 1S and 2S will open due to the low frequency/voltage (reverse power) sensing device. Sensing a loss of power, via the SS/E-S bus-ties, on one or both of the SSTG busses the associated SS/EDG(s) will start automatically. Upon buildup of voltage the local SS/EDG - SSTG bus-tie breaker will open and the EDG/SSDG generator breaker(s) will close supplying power to its local emergency switchboard automatically and thereby supplying emergency power to the ship via the normal emergency power distribution system.

2.0.1.2 When it becomes necessary to configure one of the SS/EDG's to supply ship service power the system can be reconfigured so that the remaining SS/EDG can supply Emergency Power automatically to both Emergency Switchboards. When operating in this mode, assuming that SS/EDG No.1 is supplying ship service power along with 1SA & 1SB SSTG's, the bus-tie between SS/EDG No. 1 & 1S will be closed. The bus-tie between SS/EDG No. 1 & SS/EDG No. 2 will be closed on the EDG1 end only. SS/EDG No. 1 distribution breaker supply 1E Switchboard will be closed and SS/EDG No.1 mode selector switch will be in Ship Service Mode. SS/EDG No. 2 mode selector switch will be in Stand-by Mode. The SS/EDG No. 2 distribution breaker supply 2E Switchboard will be closed and the 2S/EDG2 bus-tie will be closed.

2.0.1.3 If it becomes necessary to configure both of the SS/EDG's to supply ship service power the system will need to be manually reconfigured in order to supply emergency power depending on the availability of generators and switchboards. When operating in this mode SS/EDG No. 1 & 2 mode selector switches will be in the manual mode and the bus-ties between switchboards SS/EDG No.1 & 1S and SS/EDG No. 2 & 2S will be closed. The bus-tie between SS/EDG No. 1 & 2 will normally be opened and the bus-tie between 1S & 2S will normally be closed. The SS/EDG distribution breakers feeding the

emergency switchboards will be closed. Upon the loss of two ship service generators the bus-ties between the 1S/2S switchboards should open. The bus-ties between SS/EDG No.1 & 1S and SS/EDG No. 2 & 2S should be manually opened to isolate the SS/EDG's from the ship service distribution system until the cause of the casualty can be identified. If it is possible and safe, one of the SS/EDG's should be manually started. The EDG generator and emergency switchboard distribution breakers should be closed as well as the bus-tie between SS/EDG No. 1 & 2 to supplying emergency power to the 1E & 2E switchboards. Under Manual mode all the automatic sensing and control devices are turned off, except the 1S/2S bus-tie power-sensing device. While in this mode testing and routine maintenance can be performed.

2.0.1.4 Maintenance Mode: This mode is intended to deactivate all auto and manual start capabilities so that inspection and maintenance can be performed safely on a single in-service EDG unit, at a time. The remainder of the generation system will reconfigure it's operation to take into account the out of service EDG unit. The remaining EDG unit will operate in emergency mode only.

2.0.2 The generator and its prime mover shall be mounted on a common subbase. The subbase shall provide full stiffness and support for the generator set without the reliance on external foundations or stiffeners to maintain operational conditions including proper alignment of components. The generator set shall be designed and built to commercial marine standards as reflected in IEEE 45 and ABS (American Bureau of Shipbuilding) standards for shipbuilding.

2.0.3 Interfaces with the ship shall be minimized to provide single interface points for intake (combustion) air, exhaust air, fuel oil supply, fuel oil return, cooling seawater inlet, cooling seawater discharge, lubricating oil fill, lubricating oil drain (purifier input), 440 volt ac power input, 110 volt ac power input on each diesel generator set and each switchgear group as required. Inlet air systems will be allowed to have up to two interface connections.

2.0.4 The generator sets shall produce 450 Volt, 3 Phase ungrounded, 60 Hertz electric power to a minimum total load ranging from 600 to 1825 KW at 0.8 power factor continuously.

2.0.5 The generator set shall withstand a bolted short circuit at the terminals of the generator for a period of two minutes without sustaining any permanent damage to the set.

2.0.6 The generator set shall minimize the heat rejected to the surrounding space. The majority of heat generated by the set shall be dissipated to seawater via plate type heat exchangers.

2.0.7 The generator set shall incorporate features to improve performance and reduce maintenance when the set is operated for extended periods at the low end of the required operating load range. The generator sets shall incorporate the features identified below, and any other commercially available features which improve performance and reduce maintenance of the diesel generator set when operated for extended periods at loads less than 40 percent of rated load.

a. Centrifugal bypass lubricating oil filter
b. Long life engine coolant inhibitor
c. Self-Flushing or Back-Flushing Reduced Maintenance Lube oil filter
d. Pump driven lube oil change out system

2.0.8 The generator set shall perform its function without major overhaul for at least 20,000 operating hours. The design life of the generator set shall be at least 40,000 operating hours.

2.0.9 The dimensions of the generator set shall be such that installation in a space 40 feet long, 19 feet wide and 16 feet high will still allow sufficient access around the generator set to perform any required maintenance, including, but not limited to, removal of the generator rotor; removal of heads, pistons, and cylinder liners; and removal of all major support components.

2.0.10 The generator set shall be equipped with the following safety protection devices or a functional equivalent at a minimum:

a. Reverse Power Monitor
b. Over Power Monitor, (2 Stages to Load Shed Non-Vital and Semi-Vital Loads)
c. Under Frequency Monitor
d. Electrical Ground Detection Devices

2.1 DIESEL ENGINE

2.1.1 The intent of this specification is to procure current production diesel engines as the prime movers for the generator sets. The manufacturer shall certify that the engine provided is a current production model and has a background of at least 10000 hours of satisfactory operation (i.e. no failures requiring corrective maintenance) in applications where the loading is at least 1640 eKW. The engines shall be certified in accordance with ABS Rules for Steel Vessels. Instrumentation, alarms, and controlling devices shall be supplied to conform with rules for unmanned engineering spaces. The Government will monitor ABS efforts to certify the engines. Where there is a conflict between ABS Rules and these specifications, these specifications shall take precedence.

2.1.2 The engine speed and rated power shall be as determined by the manufacturer to meet the generator set performance requirements of this specification.

2.1.3 The engine shall be jacket water cooled. Separate circuit aftercooler (if equipped) shall utilize treated potable water. All necessary pumps shall be supplied and engine driven. All heat exchangers shall be supplied and be of the plate type suitable for marine seawater service. All supplied heat exchangers shall be on supports suitable for deck mounting. Any supplied auxiliary equipment that is not part of the assembled engine will be supplied with separate mountings and not attached to the engine/generator subase. All necessary connections such as hoses and piping to connect to these components shall be supplied.

2.1.4 An appropriate exhaust muffler shall be provided. The muffler shall be sized to meet the recommended exhaust back pressure limits of the engine when installed as part of a 200ft long exhaust duct with four right angle bends in the run. The muffler shall provide engine exhaust noise reduction of at least 10dB(A).

2.1.5 The engine shall not exhaust oil-laden air into the space in which it is installed.

2.1.6 Drains required to completely remove all liquids from the engine shall be provided with isolation valves and piped to dedicated termination points on the set.

2.1.7 The starting system shall utilize 150 psi supply air.

2.1.8 The engine will meet all performance criteria when operating on Naval Distillate Fuel (MIL-F-16884, (NATO Symbol F-76) and have the ability to operate on JP-5 (NATO Symbol F-44).

2.1.9 The engine shall be certified to meet the emissions requirements of Annex VI of MARPOL 73/78 in effect at the time of the solicitation.

2.1.10 If the engine requires electrical power to be available in order to start/run, then a separate source of power (battery with an alternator, Uninterruptible Power Supply, etc.) shall be provide under this Performance Specification for that purpose.

2.1.11 A fuel oil cooler shall be provided for maintaining a suitable fuel oil return temperature.

2.1.12 Interface piping connections shall be flanged in accordance with ANSI B16.5. All piping in contact with seawater shall be copper-nickel 70/30 or 90/10. No pipe threaded connections shall exist in any of the seawater piping.

2.1.13 The following instrumentation, at minimum, shall be provided on an engine mounted (local) instrument panel for each engine:

Pressure Indicators	**Temperature Indicators**	**Miscellaneous**
Lube Oil at Gallery Inlet	Jacket water from engine	Engine Speed Tachometer
Fuel Oil Filter Delta	Lube oil from engine	Engine Hourmeter
Air Intake Manifold	Individual Cylinder Exhausts	Start Counter
Crankcase	Turbocharger (if fitted) Inlet and Exhaust	
Starting Air to Starter	Charge Air to Manifold	

Oil Filter Delta		
Jacket water Pump Disch.		
Aftercooler Pump (if fitted) Disch.		

2.2 GENERATOR

2.2.1 The generator shall employ a brushless means for excitation and shall be controlled by a static voltage regulator. The generator shall be totally enclosed, air cooled via an air to seawater heat exchanger.

2.2.2 The generator shall be provided with a means to prevent condensation of moisture on the windings of the machine during periods when the generator is not energized. The system used shall automatically activate upon opening of the associated generator breaker and deactivate upon closure of the generator breaker.

2.2.3 The generator design shall prevent the flow of shaft currents through the generator and prime mover bearings.

2.2.4 The generator shall provide means to monitor and indicate the temperature of the stator windings, air into the air cooler, and air out of the air cooler. Temperature indication shall be provided on the associated switchgear and at the main EOS panel.

2.2.5 The following instrumentation shall be provided, at minimum, for each engine on flat screen display(s) at each of the following locations

a. First Generator Operating Panel
b. Second Generator Operating Panel
c. Central Engineering Control Station (Main Control) Console

Pressure	**Temperature**	**Electrical**	**Miscellaneous**
Lube Oil Filter Inlet	Lube Oil to Cooler	Generator Power (KW)	Engine Speed
Lube Oil Engine Inlet	Lube Oil fm Cooler	Current (Amps)	Oil Sump level (or low level indicator)
Crankcase	Jacket water to Cooler	Output Voltage (Volts)	Jacketwater expansion tank level (or low level indicator)
Fuel Oil Supply (fm pump)	Jacket water fm Cooler	Frequency (Hz)	Aftercooler Circuit (if fitted) expansion tank level (or low level indicator)
Jacket Water Pump	Water to Air Charge Cooler (if fitted)	Power Factor (pf)	Fuel Rack Position or Load Factor
Inlet Air Manifold	Water fm Air Charge Cooler (if fitted)	Synchroscope	Fuel Consumption Meter(instantaneous)
Air filter Differential	Cylinder Charge Air		Fuel Consumption Meter (totalized)
Turbocharger (if fitted) discharge, Each	Turbocharger (if fitted) turbine exhaust. Each.		
	Combined Exhaust (Each Bank)		
	Fuel to engine		

Notes:
1. All displays shall have functionality to display desired engines parameters at each station.
2. One or more displays may be supplied for each station.
3. Data may be displayed in one or more groups. If groups are used, they shall be user defined in a minimum number of six parameters per screen, or shown in suppliers defined groups such as general operation, lube oil group, water circuits, air circuits, etc.
4. Interaction to move between screens (if applicable) shall be by touch screen or ruggedized keyboard/mouse arrangement.
5. Displays shall provide indication of any and all warnings, shutdowns, derates, or ‘fault” codes from running engine(s).

6. Readings shall be displayed in English Units.

2.3 TEST REQUIREMENTS

2.3.1 SYSTEM TESTING. The complete system shall be assembled for test at the manufacturer's factory. Tests shall include demonstration of the following:

2.3.1.1 Emergency start of both generators upon sensing a dead bus.
2.3.1.2 Paralleling of each generator across the bus tie and generator breakers to the other generator in both isochronous and droop modes and to an infinite bus (shore power) in droop mode only.

2.3.1.3 Controlled transfer of load from one generator to the other generator.

2.3.2 COMPONENT TESTING

2.3.2.1 The diesel generator set testing shall include the following:

2.3.2.1.1 Four hour heat run - The set shall be started and the load stabilized at 1825 kW, 0.8 power factor. Temperatures shall be recorded at intervals of no more than 15 minutes.

2.3.2.1.2 Short Circuit - A bolted short circuit shall be applied to the output of the generator set for a period of 20 seconds. Sufficient data shall be recorded to accurately construct the output voltage and current waveforms throughout the period of the short circuit.

2.3.2.1.3 Frequency and voltage regulation - The generator set output shall be stabilized at 450 Volts and 60 Hz at no load. Load shall be added in approximately five steps from 600KW to 1825KW at 0.8 power factor without making any adjustments to the governor or voltage regulator settings. The change in voltage and frequency at each step shall be recorded.

2.3.2.1.4 Transient response - With the generator set running at no load a block load of 750KW, 0.8 power factor shall be applied to the Gen Set. Once stabilized an additional block load of 750KW, 0.8pf shall be applied, followed by a final block load of 325KW, 0.8pf to bring the system to a total load of 1825KW. Sufficient data shall be taken to accurately construct the generator output voltage and frequency transient waveforms. The test shall then be repeated in reverse order, taking the total system load back down to 1500KW, 0.8pf, followed by 750KW, 0.8pf and then down to no load.

2.3.2.1.5 Starting - With the diesel generator set at its normal standby condition, the diesel generator set shall be started, run at idle speed for one minute, and then secured. This sequence shall be repeated ten times without failure and without recharging the starting system.

2.3.2.1.6 Fuel Efficiency - The generator set shall be operated at various loads throughout the required load range. The input fuel rate shall be measured in terms of pounds per hour. Sufficient data shall be taken to provide an accurate data curve of fuel rate vs. output electrical power.

2.3.2.1.7 Low Load Operation - The diesel generator set shall be operated continuously at an electrical output of 600 KW, 0.8 Power factor, for a period of 100 hours. Following this period the exhaust manifold and airbox shall be inspected to verify no accumulations of carbon and oil beyond a slight oil film.

2.3.2.2 The generator shall be tested in accordance with IEEE Std 115 to include the following tests at a minimum:

2.3.2.2.1 Insulation resistance
2.3.2.2.2 Dielectric Strength
2.3.2.2.3 Resistance Measurements
2.3.2.2.4 Phase Sequence
2.3.2.2.5 Stator terminal voltage - Waveform deviation and distortion factors
2.3.2.2.6 Saturation curves, segregated losses, and efficiency

2.3.2.2.7 Tests for determining parameter values for steady state conditions
2.3.2.2.8 Tests for evaluating transient/subtransient characteristic values.

2.3.3 Following completion of testing the system shall be disassembled into major subsystems and packaged for shipment.

3.0 CONTROL AND DISTRIBUTION SWITCHGEAR (CLINs 0001AB and 0003AB)

3.1 Three sets of controls and one set of distribution switchgear shall be provided for each power system. One set of Control (for both SS/EDGs) and distribution switchgear shall be provided local to each of the two Generator Sets in the Ship Service/Emergency Switchboard (SS/E SWBD). A third operating panel shall third set of controls shall be remotely located in the Enclosed Operating Station (EOS), in "Main Control" (Engine Room 8-86-0-E), on the upper level. The purpose of the remote panel is to allow the ship to operate the new Ship Service / Emergency Diesel Generators (SS/EDG) for extended periods of time from "Main Control" with little or no manning at the diesels or in their associated local Enclosed Operating Stations.

The SS/EDG shall have an integrated panel for remote monitoring and full system (SSTG & SS/EDG) functional control in addition to the monitoring instruments and controls at the SS/EDG Switchboards and Diesels. The remote monitoring and control panel will have, for example, the following:

- System status mimic board
- SS/EDG Mode Switches
- Circuit breaker status lights and control switches
- Voltmeter, ammeter, wattmeter, & frequency-meter
- Synchroscope & synchronizing lights
- Speed & voltage adjusting switch
- Governor mode selector switch
- Engine speed indicator
- Engine lubrication oil & Fuel pressure indicator
- Lube oil temperature indicator
- Jacket water temperature indicator
- Intake manifold air temperature indicator
- Exhaust stack temperature indicator
- Engine starting control switch or air solenoid valve
- High temperature alarms

The panel will be capable of monitoring and controlling all on-line ship service power and in-coming generators along with providing remote paralleling capability. The panels should be designed and built by the diesel-generator set manufacturer so that it is fully integrated with the new diesels, new switchboards and modified existing switchboards. The remote monitoring and control panel will be located in the Enclosed Operating Station (EOS), in "Main Control" (Engine Room 8-86-0-E), on the upper level. The remote panel should be designed to fully support the purpose for which they are intended, as noted above, and should support, as a minimum, the operational scenarios noted herein. Figure 1 is a block diagram of the desired configuration. Controls for each of the diesel generators shall include the following functions:

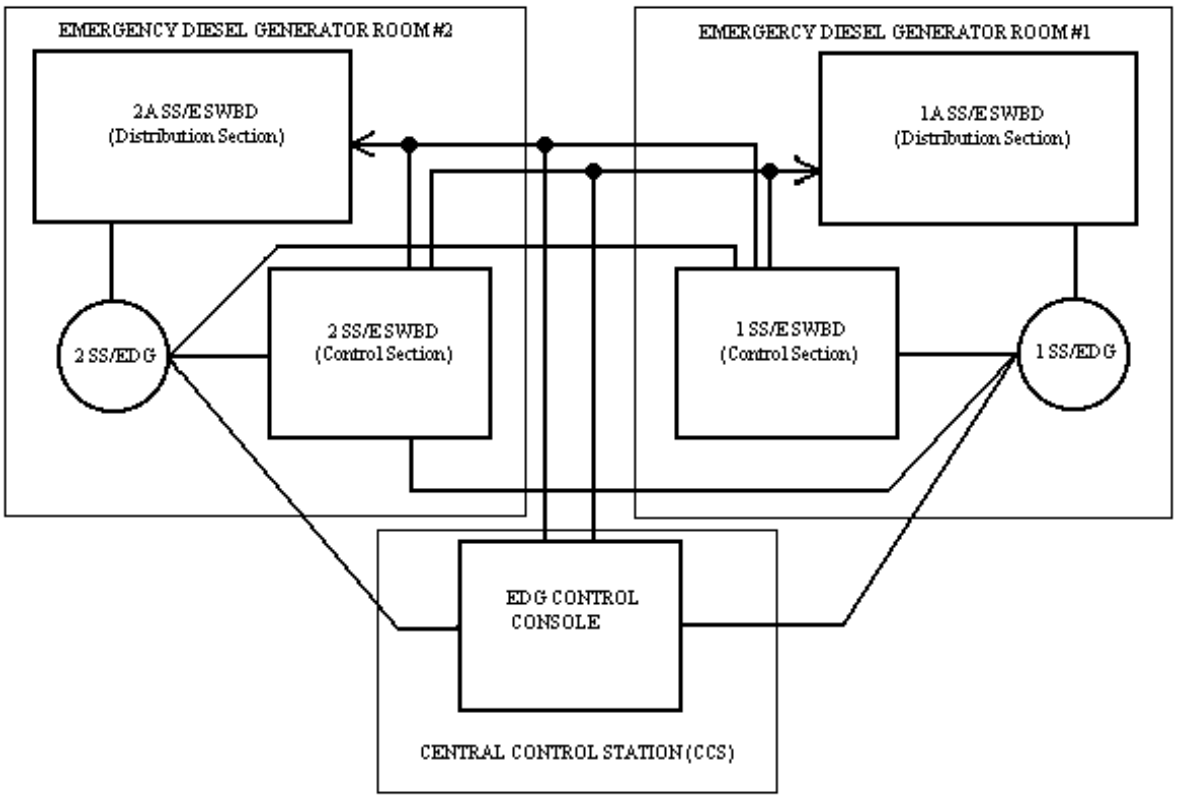

FIGURE 1 INSTRUMENTATION & CONTROL BLOCK DIAGRAM

3.1.1 Normal start which results in a normal warm-up of the diesel in accordance with the manufacturer's recommendations, followed by ramped acceleration of the diesel to normal operating speed and excitation of the generator to produce specified voltage and frequency at the output of the generator. This start shall be initiated by a single operator action (push-button start).

3.1.2 Emergency start which results in an immediate acceleration of the diesel to normal operating speed, excitation of the generator and the closure of the generator circuit breaker. This start shall be initiated by the loss of voltage on the associated distribution bus. The elapsed time from when the voltage on the bus falls below 350 volts to when the diesel generator set has come on line and the bus is reestablished to a nominal 450 volts shall not exceed 10 seconds.

3.1.3 Normal stop which shall result in the opening of the generator breaker, the securing of excitation power to the generator, the reduction in speed of the diesel engine to the cool down idle speed recommended by the engine manufacturer, securing of the diesel after the cool down time recommended by the manufacturer. The set shall be capable of being restarted at any time during the cool down period or after completion of the normal stop sequence.

3.1.4 Emergency stop which shall result in the opening of the generator breaker, the securing of excitation power to the generator, immediate securing of the combustion air supply to the engine, and securing of the fuel system.

3.1.5 Maintenance start, which shall start the diesel and leave the diesel running at idle speed, with generator de-energized.

3.1.6 Controlled transfer of load between paralleled diesel generator sets and between each of the diesel generator sets and an auxiliary power source (shore power and main ship service distribution system). Load transfer shall maintain the distribution system power characteristics within the limits established by paragraph 1.1 throughout the transfer.

3.2 All three control switchboards/consoles shall provide instrumentation and controls for controlling the frequency and voltage of both of the diesel generator sets. Automatic and manual controls for synchronizing across the generator and bus-tie breakers shall also be provided at all three locations.

3.2.1 Instrumentation and controls shall be clearly labeled with nameplates on the face of the switchgear.
3.2.2 Provisions for remote indication of a summary alarm for the system shall be provided.

3.3 Each set of switchgear shall include a generator circuit breaker to connect the associated generator with the distribution bus of the switchgear, two bus tie breakers sized to provide the full power of the associated generator to the other sets of switchgear (one to the other SS/E SWBD and one to the existing main SS SWBD's), and three output breakers (1600A) to provide power to two (2) new C4I load centers and the associated existing Emergency Switchboard (E SWBD) as a third load center. The two new C4I load centers shall each be fed from one SS/E SWBD as a normal source and the other as an alternate source of power. Paralleling circuitry shall be provided to support paralleling across the generator breakers and the bus tie breakers. See Figure 2 for a functional Block Diagram of the desired Distribution System.

3.4 Two new C4I Load Centers shall each be provided along with the following:

2 - 400 amp, 450 Volt Circuit
4 - 250 amp, 450 Volt Circuits
4 - 225 amp, 450 Volt Circuits (250A Frame Size)
6 - 100 amp, 450 Volt Circuits
6 - 75 amp, 450 Volt Circuits (100A Frame Size)
4 - 100 amp, 120 Volt Circuits
4 - 75 amp, 120 Volt Circuits
4 - 50 amp, 120 Volt Circuits

3.4.1 Spare mountings for six (6) 250 Amp breakers shall be provided in the 450 Volt section of the distribution panels.
3.4.2 Built in 1600A Manual Bus Transfer (MBT) section shall be provided in each load center in addition to the distribution section, including two 1600 amp manual circuit breakers per load center.

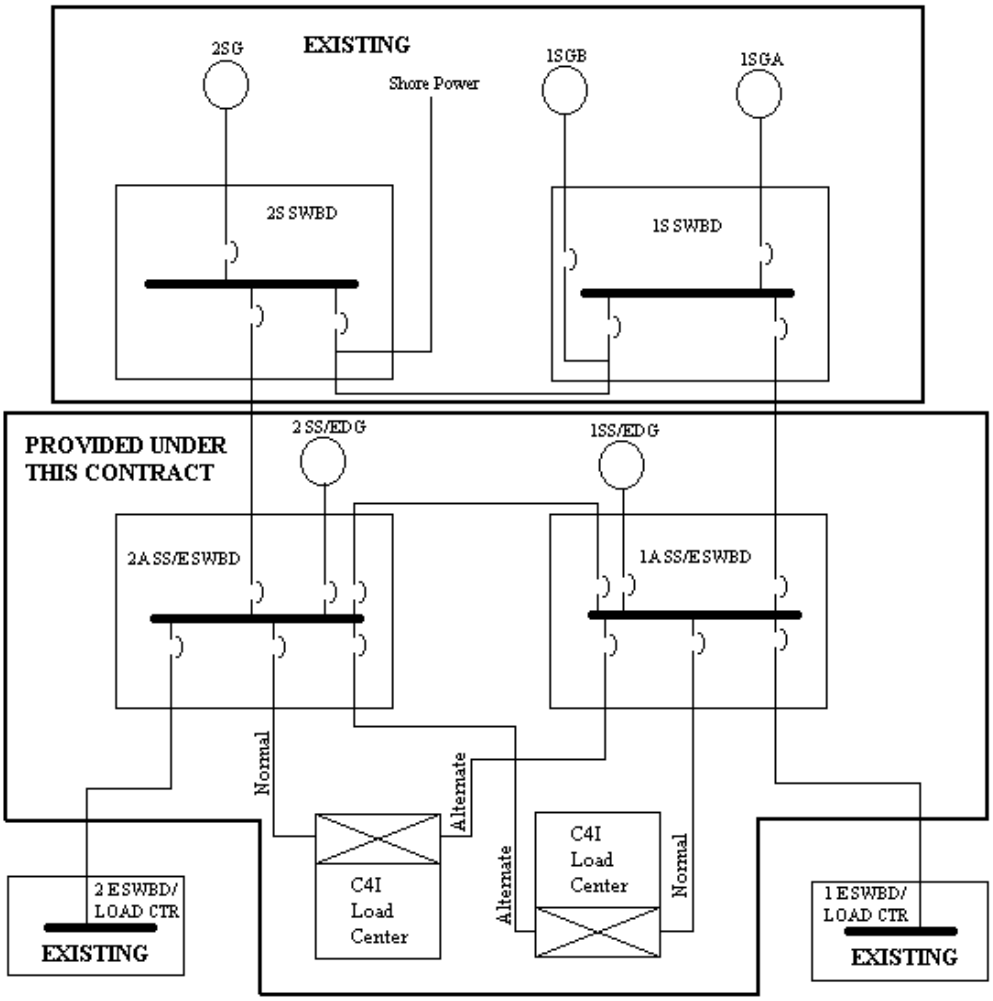

FIGURE 2 DISTRIBUTION SYSTEM BLOCK DIAGRAM

3.5 All circuit breakers shall be in accordance with either ANSI/IEEE C37.13 or UL 489 with Marine Supplement.

3.6 Provisions for stowage of special tools required for maintenance of the switchgear shall be provided within the switchgear.

3.7 The sets of control, distribution, and load center switchgear shall be sectionalized to provide for ease of installation and handling. Each section of the control and load center switchgear shall not exceed 82 inches high by 30 inches wide by 42 inches deep. Each section of the distribution (bus-tie) switchgear shall not exceed 92 inches high by 21 inches wide by 90 inches deep. Control and Distribution Switchboards shall be separated the sections within the control switchboards and within the distribution switchboards shall be capable of being directly coupled to adjacent sections in the same set of switchgear such that one main bus for each voltage level is used throughout the set of switchgear. Sections shall be dripproof protected

3.8 The overall dimensions of each set of control and Load Center switchgear shall be less than 82 inches high by 60 inches wide by 42 inches deep and the overall dimensions of the distribution switchgear shall be less than 92 inches high by 63 inches wide by 90 inches deep.

4.0 SHOCK QUALIFICATION REQUIREMENTS (CLINs 0001 and 0003)

4.1 The Power System shall be Grade A, shock-qualified as a principal unit by shock test or by extension in accordance with MIL-S-901D in either the Hull or Deck mounted configuration.

4.1.1 HULL MOUNTED: For design and analysis and test purposes, shock loading shall be representative of a hull mounted installation as defined in MIL-S-901D. Inputs shall be in accordance with NAVSEA 0908-LP-000-3010, Rev. 1.

4.1.2 DECK MOUNTED: For design and analysis and test purposes, shock loading shall be representative of a Deck mounted installation as defined in MIL-S-901D in either a Class I or Class II configuration. For Class I installation, inputs shall be based on deck frequencies supplied by the Navy. For Class II installations, inputs shall be based on a fixture which simulates deck mounted conditions with a fundamental frequency of 12 to 16 Hertz. If Class I equipment utilizes Class II subsidiary components or subassemblies, the equipment must meet both Class I and Class II requirements.

4.2 If the equipment manufacturer or shipbuilder intends to shock-qualify the equipment by extension, a shock extension request shall be included in the RFP response for Navy approval. The extension request shall address the requirements for shock-extension documented in paragraph 3.2 of MIL-S-901D. If the Navy does not approve the extension request, the equipment shall be shock-tested and qualified in accordance with MIL-S-901D.

5.0 CONTRACT DATA REQUIREMENTS LIST (CDRL) (CLINs 0002 and 0004)

5.1 **CLIN 0002** - The following are the CDRL requirements for CLIN 0002:

5.1.1 Monthly progress, status and management reports. (CDRL A001)
5.1.2 Production test procedures. (CDRL A002)
5.1.3 Production Test and inspection report. (CDRL A003)
5.1.4 Notification of testing for all production testing performed under CLIN 0001. (CDRL A004)
5.1.5 Award conference agenda and minutes of award meeting. (CDRL A005)
5.1.6 Failure summary and analysis reports for any failures experienced. CDRL A006)
5.1.7 Commercial drawings and lists of materials for all components supplied. (CDRL A007)
5.1.8 Installation drawings for equipment to be supplied. (CDRL A008)
5.1.9 Commercial technical manuals and supplemental technical information for all supplied equipment, published (hard copy) and electronic versions. (CDRL A009)
5.1.10 Proposed spare parts list for all recommended spares to carried aboard ship. (CDRL A010)
5.1.11. Proposed spare parts list for outfitting spares. (CDRL A011)
5.1.12 Report of Engineering technical services and accomplishments. (CDRL A012)
5.1.13 Logistics Management Information summaries. (CDRL A013)
5.1.14 Provisioning parts list for equipment provided. (CDRL A014)
5.1.15 Design change notices for engineering changes made to equipment provided. (CDRL A015)
5.1.16 Component identification data (CDRL A016)
5.1.17 Planned Maintenance System program, Functional failure analysis, Failure Modes and effects analysis, and indexing system (CDRL A017)
5.1.18 Certification for emissions requirement in paragraph 2.1.9 and ABS certifications of paragraph 2.0.2 and 2.1.1. (CDRL A018)
5.1.19 Documentation for Shock Certification (CDRL's A019, A020, A021, and A022)

5.2 **CLIN 0004** - The following are the CDRL requirements for CLIN 0004:

5.2.1 Monthly progress, status and management reports. (CDRL A001)
5.2.2 Production test procedures. (CDRL A002)
5.2.3 Production Test and inspection report. (CDRL A003)

5.2.4 Notification of testing for all production testing performed under CLIN 0003. (CDRL A004)
5.2.5 ***REQUIRMENT DELETED***
5.2.6 Failure summary and analysis reports for any failures experienced. (CDRL A006)
5.2.7 Commercial drawings and lists of materials for all components supplied. (CDRL A007)
5.2.8 Installation drawings for equipment to be supplied. (CDRL A008)
5.2.9 Commercial technical manuals and supplemental technical information for all supplied equipment, published (hard copy) and electronic versions. (CDRL A009)
5.2.10 Proposed spare parts list for all recommended spares to carried aboard ship. (CDRL A010)
5.2.11 Proposed spare parts list for outfitting spares. (CDRL A011)
5.2.12 Report of Engineering technical services and accomplishments. (CDRL A012)
5.2.13 Logistics Management Information summaries. (CDRL A013)
5.2.14 Provisioning parts list for equipment provided. (CDRL A014)
5.2.15 Design change notices for engineering changes made to equipment provided. (CDRL A015)
5.2.16 Component identification data (CDRL A016)
5.2.17 Planned Maintenance System program, Functional failure analysis, Failure Modes and effects analysis, and indexing system (CDRL A017)
5.2.18 Certification for emissions requirement in paragraph 2.1.9 and ABS certifications of paragraph 2.0.2 and 2.1.1. (CDRL A018)
5.1.19 Documentation for Shock Certification (CDRL's A019, A020, A021, and A022)

Specific requirements of all the data requirements are included with the DD forms 1423 attached to this solicitation.

6.0 INSTALLATION SUPPORT SERVICES REQUIREMENTS (CLINs 0005 and 0006)

6.1 **CLIN 0005**. This item is technical labor for installation support of the items supplied by CLIN 0001. Specific dates and location of shipyard are not available at this time, however, the location will be within CONUS. The Government estimates that the following level of effort will be required:

6.1.1 A total of 400 labor hours are to be supplied by a senior technical representative of the equipment supplier. It is estimated that up to five (5) separate trips of 80 hour labor hour durations will be required to complete this requirement. A typical workday shall include 10 labor hours. The representative will be responsible for the technical assistance needed to interface between the government installation supervisor and the shipyard contractor by the government to install the equipment provided in CLIN 0001. The representative shall have a working knowledge of all equipment supplied as well as resources to attain additional information as requested by the government. The representative will take on actions and assignments as directed by the government.

6.2 **CLIN 0006**. This item is technical labor for installation support of the items supplied by CLIN 0003. Support is anticipated to be required at the US Naval Ship Repair Facility, Yokosuka, Japan, however, specific dates are not available at this time. The Government estimates that the following level of effort will be required:

6.2.2 A total of 460 labor hours are to be supplied by a senior technical representative of the equipment supplier. Three (3) separate trips will be required to complete this requirement. A typical workday shall include 10 labor hours. The representative will be responsible for the technical assistance needed to interface between the government installation supervisor and the installing activity to install the equipment provided in CLIN 0003. The representative shall have a working knowledge of all equipment supplied as well as resources to attain additional information as requested by the government. The representative will take on actions and assignments as directed by the government.